Testimony of
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Before
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Committee on Government Reform
Subcommittee on Regulatory Affairs
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INTRODUCTION

Madame Chair and members of the Subcommittee, I am Lieutenant Colonel Donald P. Lauzon, Commander of the Detroit District of the U.S. Army Corps of Engineers. Thanks you for the opportunity to testify before you today on the U.S. Army Corps of Engineers role in FEMA's floodplain modernization effort and any related studies on Great Lakes water levels conduced by the Corps of Engineers.

In support of the nation, the U.S. Army Corps of Engineers often provides technical support and expertise to other government agencies, both Federal and local. The Federal Emergency Management Agency (FEMA) is one of those agencies. Over the years, the Corps has done a variety of work for FEMA, and this has included the determination of 100-year flood elevations for the Great Lakes. This testimony is meant to provide a brief summary of why and how the Great Lakes flood level studies were done. It is being provided in response to recent concerns about FEMA's remapping of flood risk in St. Clair County, Michigan.

In 1974, FEMA (then known as the Federal Insurance Administration) contracted the U.S. Army Corps of Engineers to investigate methods and determine 100-year flood levels specifically for the U.S. shoreline of the Great Lakes, using available water level data. Based on these investigations, and subsequent review and comments from Great Lakes States and other federal agencies, a procedure was developed, agreed upon and adopted. Using this procedure, the Corps of Engineers derived flood levels for various reaches of the Great Lakes and their connecting channels with certain probabilities of occurring. The results were provided to FEMA in 1977 in a report entitled "Report on Great Lakes Open-Coast Flood Levels." It consists of three volumes – Phase I, Phase II and Appendices. It was the flood levels from this report that FEMA used to map 100-year floodplains in the 1978-1982 era flood insurance rate maps (FIRMS). The Corps of Engineers did not do the flood plain mapping.

In the mid-1980s the Great Lakes experienced record high water levels, which resulted in significant flooding and damages. In some locations, the recorded water levels equaled or exceeded the 100-year flood levels published in the 1977 Great Lakes Open Coast report. For example, the highest level at the St. Clair Shores gauge on Lake St. Clair, recorded in October 1986, was 0.5 foot higher than the previous recorded high at this gauge, reached in June 1973, and equal to the 100-year flood level in the 1977 Great Lakes Open Coast report.

In 1987, FEMA contracted the Corps of Engineers to update the 1977 Great Lakes flood level study. This update retained the approach utilized in the 1977 study, and incorporated additional water level data from 1975 through the high water period of 1986. The original methodology was reviewed and determined to be hydrologically and scientifically valid. The methodology and the resulting flood levels were reviewed by the Corps of Engineers' Hydrologic Engineering Center, Water Experiment Station and Districts bordering the Great Lakes; as well as by Great Lakes States' water management agencies, FEMA, the U.S. Geological Survey, the Great Lakes Commission, and the NOAA Great Lakes Environmental Research Laboratory. The revised flood levels were provided to FEMA in the 1988 report entitled "Revised Report on Great Lakes Open-Coast Flood Levels."

The method adopted in both the 1977 and 1988 studies, analyzes the frequency of occurrence of the highest water levels recorded at a water level gauge each year over a number of years. Based on the number of years in the gauge record, and the number of times levels were exceeded, water levels with certain probabilities of occurrence were determined. FEMA has adopted the 100-year flood level as the standard for identification of flood hazard areas in conjunction with the National Flood Insurance Program. The 100-year flood level represents an event that has a one-percent chance of being equaled or exceeded in any given year. Figure 1 shows the recorded water level data as a percent of years each water level would be expected to be exceeded. The line that best fits the data points is used to determine the 100-year elevation, which would be the level with a 1 percent chance of being exceeded in any given year.

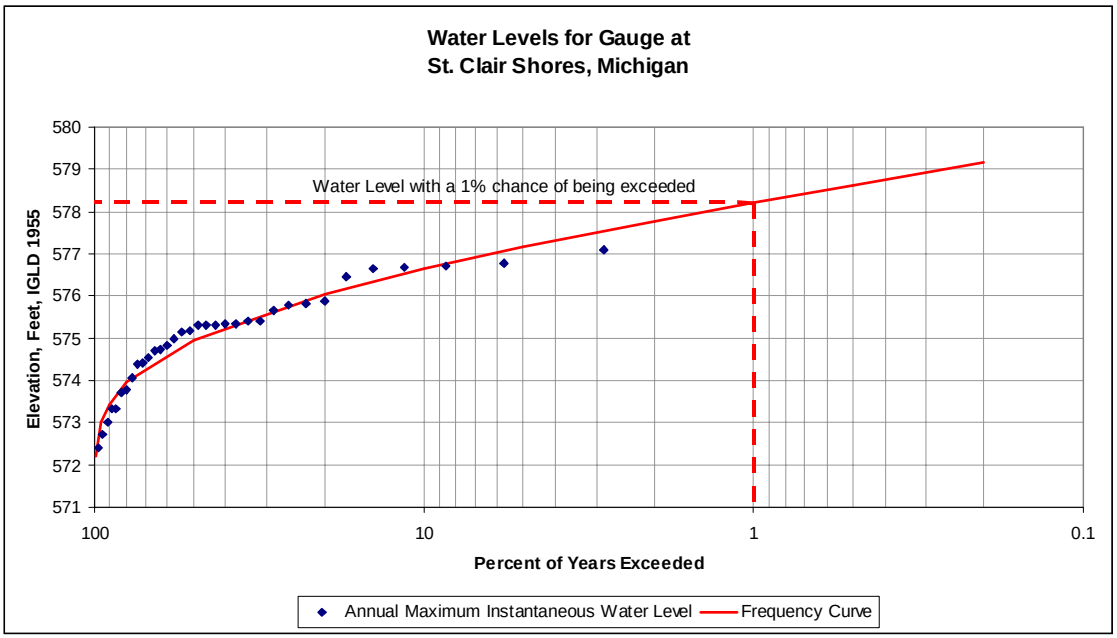

Figure 1 – Frequency Curve for water levels at St. Clair Shores gauge, 1953-1986.

All the recording water level gauges on the Great Lakes and the connecting channels, with at least 10 years of record, were used in these studies. Each reach of Great Lakes shoreline was represented by a gauge or combination of gauges. The highest instantaneous water level recorded each year were used in these analyses. The instantaneous water level represents, not only the still water (undisturbed) elevation of the lake, but also includes the effects of wind set-up (storm surge) at the gauge location. Figure 2 illustrates how these are related. Wave run-up caused by storm waves meeting the shore is not included in the water level gauge record, and was not considered in the 1977 or 1988 studies.

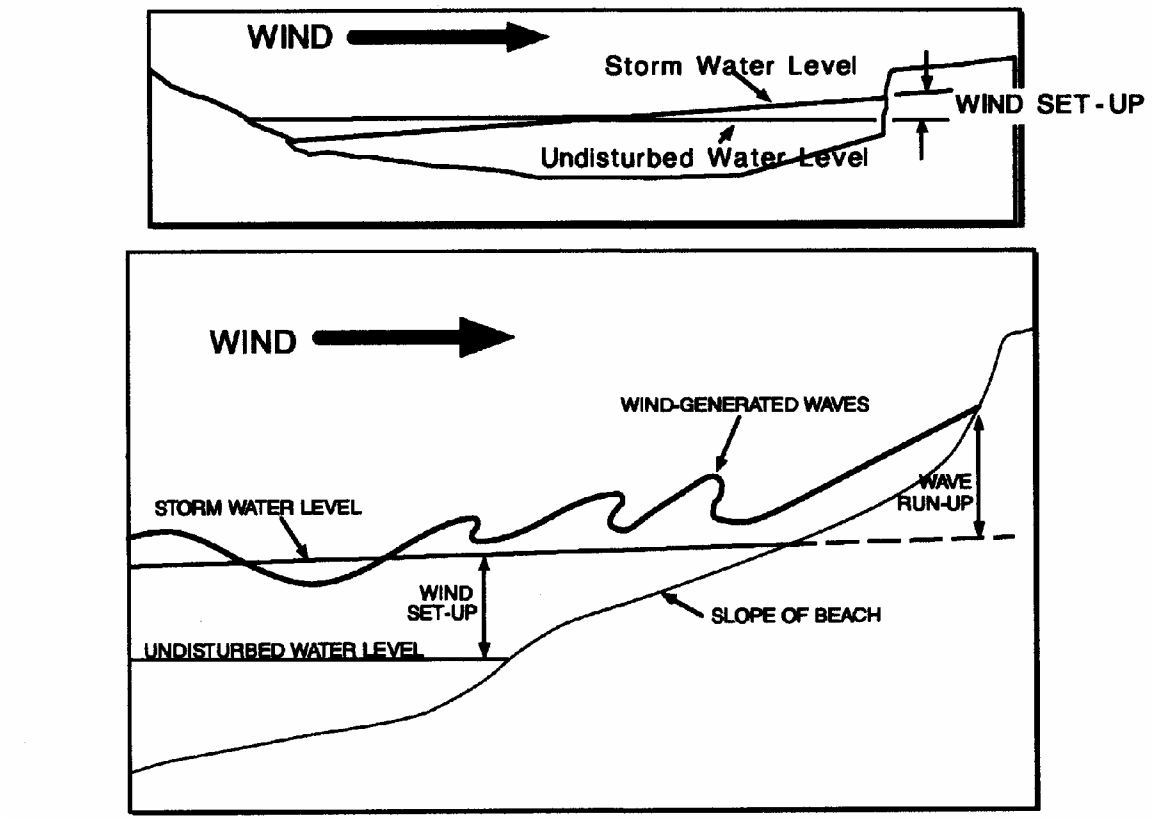

Figure 2 – Components Contributing to Flood Levels

For communities bordering Lake St. Clair, the flood level determinations were made using water levels recorded at the St. Clair Shores gauge (Figure 3). At the St. Clair Shores gauge, the difference in the 100-year flood elevations from the 1977 study to the

1988 study is an increase of 1.1 feet (13 inches). The Anchor Bay portion of Lake St. Clair has different dynamics than the open lake. Strong winds from the south often push water higher in the bay than on the more open shores of the lake. For that reason, the State of Michigan contracted the Corps of Engineers to do a separate study to determine flood elevations in Anchor Bay, specifically considering the effects of wind set-up. This study, done in 1989, determined 100-year flood elevations for reaches in the bay. Wave run-up, caused by storm waves meeting the shore, was not included. The Anchor Bay study resulted in 100-year flood elevations that are 0.2 to 0.4 feet higher than the 100-year flood level for the open lake reported in the 1988 report.

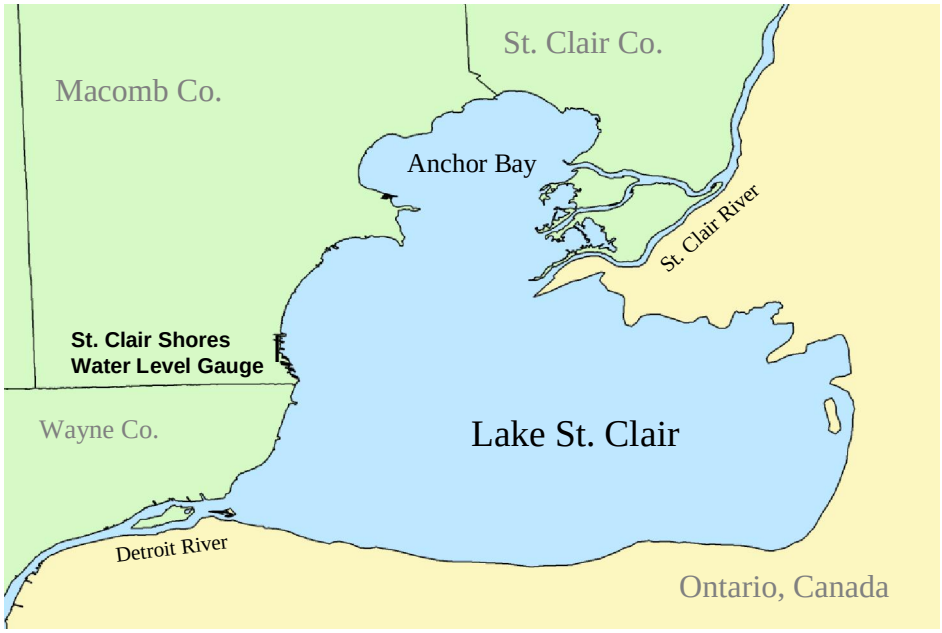

Figure 3 – Lake St. Clair

FEMA is using the flood levels from the 1988 Great Lakes Open Coast study to update the flood insurance rate maps for the open coasts of the Great Lakes and their connecting channels. For Anchor Bay, in St. Clair and Macomb Counties, FEMA is using the elevations from the 1989 study done by the Corps of Engineers for the State of Michigan. FEMA considers these two sources of flood elevations to be the best currently available.

Following the record high levels of 1985-1987, the Great Lakes, including Lake St. Clair, continued to be well above average into 1998. In fact, the 1997 levels of Lake St. Clair and Lake Erie were within a few inches of the record highs of 1986. Very dry conditions across the Great Lakes basin coupled with a mild winter with little snow or ice cover, caused a rapid decline in the water level on Lake St. Clair in late 1998. By 1999 the level of Lake St. Clair was below its long-term average. In the six years since then, the level of Lake St. Clair has remained at or below its long-term average. Even at its lowest point since 1998, Lake St. Clair was still well above the record and near record low levels of

the past. Figure 4 is a water level hydrograph of historic annual average Lake St. Clair water levels.

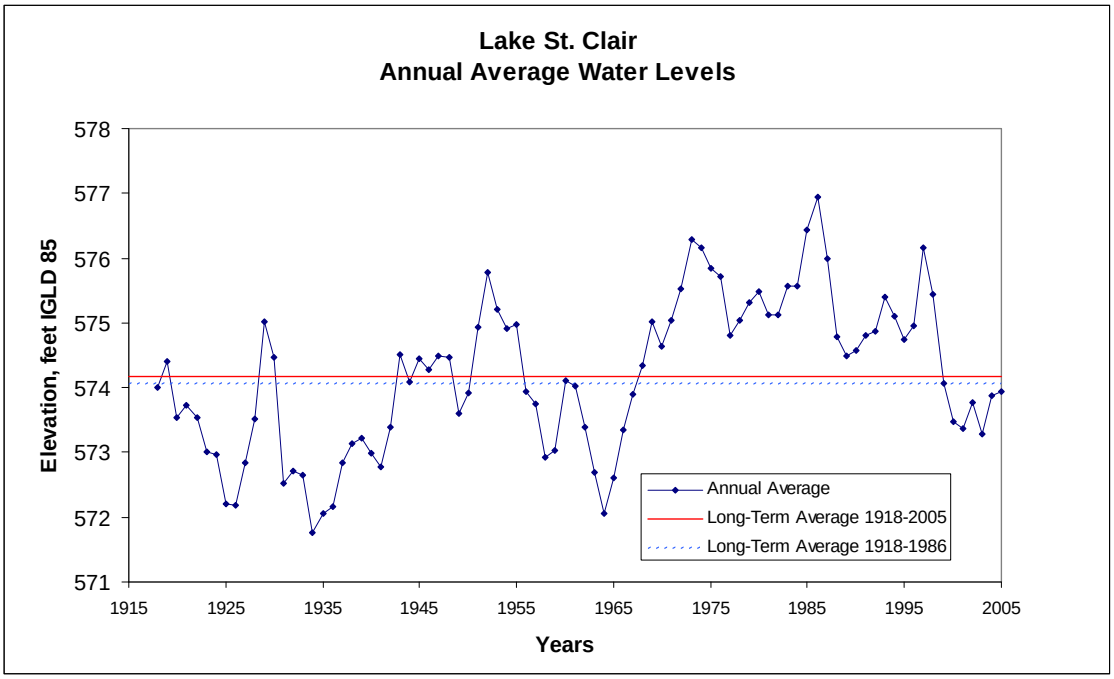

Figure 4 – Historic Water Level Fluctuation on Lake St. Clair

Water level fluctuation on the Great Lakes is driven by the weather. Rain, snow, temperature, ice cover, evaporation - all affect water levels. The Great Lakes have been in existence for thousands of year, but water levels have only been recorded for a relatively short portion of that time. It is very likely that the lakes may reach higher and lower levels than those that have been recorded. Past experience has shown that relatively rapid changes in water levels can occur. A level near average during a given year could be significantly higher or lower a couple of years later.

Because of the nature of the determination of the probabilities of occurrences associated with flood levels, if the period of record is sufficiently long, it generally takes extreme events, either very high or very low water levels, to make a significant difference in the predicted flood levels. While water levels on Lake St. Clair during the last eight years have been below average, they are not extremely low. On the other hand, the levels of Lake St. Clair for the 12 years following the record highs of 1986 were often substantially above average. Adding data with such a mix would not be expected to significantly impact the predicted 100-year flood level. However, other factors such the

frequency and severity of storms during that period and the effect of increasing the period of record, also need to be considered.

A 1993 report done by the International Joint Commission (IJC) has recently been cited as having proposed a better method for determining probabilities of flooding on the Great Lakes. The report referred to is Annex 3 of the report "Levels Reference Study – Great Lakes and St. Lawrence River Basin," completed by the IJC in 1993. The Levels Reference Study was conducted in response to the record high waters of the mid-1980s, which combined with storms caused extensive flooding and erosion of lake shorelines and severe damage to lakeshore properties. This study examined methods to alleviate the adverse consequences of fluctuating water levels on the Great Lakes-St. Lawrence River basins, and to make recommendations to governments. One part of this study looked at water level statistics for decision-making. The Levels Reference Study did not determine flood levels, but used new methods to develop frequency analyses of lake levels for proposed regulation plans.

It should be remembered that the water levels of the Great Lakes have always fluctuated over time. The chances are great that in the future water levels higher or lower than those that have been recorded could occur. There are many techniques and factors that can be considered in the determination of flood probabilities. The methodologies used in the 1988 Great Lakes Open Coast and the Anchor Bay flood level studies were reviewed by multiple Federal, State and independent agencies, and are considered to be valid approaches for determining flood frequencies along the Great Lakes and Lake St. Clair shorelines. Adding more years of water level data may or may not change the predicted flood levels for Lake St. Clair and Anchor Bay. FEMA is the lead agency on map modernization. The Corps would be happy to assist them in any way. Our recommendation would be to complete an updated study on Anchor Bay, using a combined frequency analysis of still water elevations through 2005, along with wind set-up and wave run-up. We believe this would more fully address the flood risk in Anchor Bay.

SUMMARY

To close, I would like to thank you once again, Madame Chair, for allowing the Corps of Engineers the opportunity to appear before this subcommittee to discuss the Corps role in FEMA's floodplain modernization effort in the Great Lakes region. I would be happy to answer any questions Members of the Subcommittee may have.

Thank you.